

WHAT IS CLAIMED IS:

1. A feature quantity extracting apparatus comprising:

5 a frequency transforming section for performing a frequency transform on a signal portion corresponding to a prescribed time length, which is contained in an inputted audio signal, to derive a frequency spectrum from the signal portion;

10 a band extracting section for extracting a plurality of frequency bands from the frequency spectrum derived by the frequency transforming section and for outputting band spectra which are respective frequency spectra of the extracted frequency bands; and

15 a feature quantity calculating section for calculating respective prescribed feature quantities of the band spectra, the feature quantity calculating section obtaining the calculated prescribed feature quantities as feature quantities of the audio signal.

20 2. The feature quantity extracting apparatus according to claim 1, wherein the band extracting section extracts the plurality of frequency bands obtained by dividing the frequency spectrum, which has been derived by the frequency transforming section, at uniform intervals on a linear scale of a frequency axis.

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3. The feature quantity extracting apparatus according to claim 1, wherein the band extracting section extracts the plurality of frequency bands obtained by dividing the frequency spectrum, which has been derived by the frequency transforming section, at uniform intervals on a logarithmic scale of a frequency axis.

4. The feature quantity extracting apparatus according to claim 1, wherein the band extracting section extracts only frequency bands within a prescribed frequency range from the frequency spectrum derived by the frequency transforming section.

5. The feature quantity extracting apparatus according to claim 1, wherein the band extracting section extracts frequency bands so as to generate a prescribed space between adjacent frequency bands extracted.

6. The feature quantity extracting apparatus according to claim 1, wherein the feature quantity calculating section calculates peak values corresponding to values at respective peaks of the band spectra, and obtains, as the prescribed feature quantities, values of difference between peak values of frequency bands.

7. The feature quantity extracting apparatus according

to claim 6, wherein the feature quantity calculating section uses binary values to represent the values of difference between peak values of frequency bands, the binary values indicating a sign of a corresponding one of the values of difference.

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8. The feature quantity extracting apparatus according to claim 1, wherein the feature quantity calculating section calculates peak frequencies corresponding to frequencies at respective peaks of the band spectra, and obtains, as the prescribed feature quantities, numerical values related to the calculated peak frequencies.

9. The feature quantity extracting apparatus according to claim 8, wherein the feature quantity calculating section calculates, as the prescribed feature quantities, values of difference between peak frequencies of frequency bands.

10. The feature quantity extracting apparatus according to claim 9, wherein the feature quantity calculating section represents the prescribed feature quantities using binary values indicating whether a corresponding one of the values of difference between peak frequencies of frequency bands is greater than a prescribed value.

11. The feature quantity extracting apparatus according

to claim 1, wherein the frequency transforming section extracts from the audio signal the signal portion corresponding to a prescribed time length at prescribed time intervals, and

wherein the feature quantity calculating section  
5 includes:

a peak frequency calculating section for calculating peak frequencies corresponding to frequencies at respective peaks of the band spectra; and

a peak frequency time variation calculating section  
10 for calculating, as the prescribed feature quantities, numerical values related to respective time variation quantities of the peak frequencies calculated by the peak frequency calculating section.

12. The feature quantity extracting apparatus according  
15 to claim 11, wherein the peak frequency time variation calculating section obtains, as the prescribed feature quantities, binary values indicating a sign of a corresponding one of the time variation quantities of the peak frequencies.

20 13. The feature quantity extracting apparatus according to claim 11, wherein the peak frequency time variation calculating section obtains, as the prescribed feature quantities, binary values indicating whether a corresponding one of the time variation quantities of the peak frequencies is greater than a prescribed  
25 value.

14. The feature quantity extracting apparatus according to claim 1, wherein the feature quantity calculating section calculates, as the prescribed feature quantities, effective values  
5 of respective frequency spectra of the frequency bands.

15. The feature quantity extracting apparatus according to claim 1, wherein the frequency transforming section extracts from the audio signal the signal portion corresponding to a  
10 prescribed time length at prescribed time intervals, and

wherein the feature quantity calculating section includes:

an effective value calculating section for calculating effective values of respective frequency spectra of  
15 the band spectra; and

an effective value time variation calculating section for calculating, as the prescribed feature quantities, numerical values related to respective time variation quantities of the effective values calculated by the effective value  
20 calculating section.

16. The feature quantity extracting apparatus according to claim 15, wherein the effective value time variation calculating section obtains, as the prescribed feature quantities, binary  
25 values indicating a sign of a corresponding one of the time variation

quantities of the effective values.

17. The feature quantity extracting apparatus according to claim 15, wherein the effective value time variation calculating section obtains, as the prescribed feature quantities, binary values indicating whether a corresponding one of the time variation quantities of the effective values is greater than a prescribed value.

10 18. The feature quantity extracting apparatus according to claim 1, wherein the frequency transforming section extracts from the audio signal the signal portion corresponding to a prescribed time length at prescribed time intervals, and  
wherein the feature quantity calculating section  
15 calculates a cross-correlation value between a frequency spectrum of a frequency band extracted by the band extracting section and another frequency spectrum on the same frequency band in a signal portion different from the signal portion from which the frequency band extracted by the band extracting section is obtained, the  
20 cross-correlation value being calculated for each frequency band extracted by the band extracting section, and the feature quantity calculating section using, as the feature quantities, numerical values related to the cross-correlation values.

25 19. The feature quantity extracting apparatus according

to claim 18, wherein the feature quantity calculating section calculates, as the prescribed feature quantities, binary values indicating a sign of a corresponding one of the cross-correlation values.

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20. The feature quantity extracting apparatus according to claim 18, wherein the feature quantity calculating section calculates, as the prescribed feature quantities, numerical values related to respective time variation quantities of the calculated cross-correlation values.

21. A feature quantity extracting apparatus comprising:  
a signal extracting section for extracting from an extracted audio signal a plurality of signal portions each corresponding to a prescribed time length; and

a feature quantity calculating section for calculating a cross-correlation value between one of the plurality of signal portions extracted by the signal extracting section and another of the plurality of signal portions, the feature quantity calculating section obtaining a numerical value related to the calculated cross-correlation value as a feature quantity of the audio signal.

22. The feature quantity extracting apparatus according to claim 21, wherein the feature quantity calculating section

obtains the cross-correlation value as the feature quantity of the audio signal.

23. The feature quantity extracting apparatus according  
5 to claim 21, wherein the feature quantity calculating section obtains a binary value as the feature quantity of the audio signal, the binary value indicating a sign of the cross-correlation value.

24. The feature quantity extracting apparatus according  
10 to claim 21, wherein the signal extracting section extracts the signal portions at prescribed time intervals, and

wherein the feature quantity calculating section includes:

a cross-correlation value calculating section for  
15 calculating the cross-correlation value at the prescribed time intervals; and

a cross-correlation value time variation calculating  
section for calculating a time variation quantity of the  
cross-correlation value as the feature quantity of the audio  
20 signal.

25. A feature quantity extracting apparatus comprising:  
a frequency transforming section for performing a  
frequency transform on a signal portion corresponding to a  
25 prescribed time length, which is contained in an inputted audio



signal, to derive frequency spectra from the signal portion;  
an envelope curve deriving section for deriving envelope  
signals which represents envelop curves of the frequency spectra  
derived by the frequency transforming section; and

5 a feature quantity calculating section for calculating,  
as feature quantities of the audio signal, numerical values related  
to respective extremums of the envelope signals derived by the  
envelope curve deriving section.

10 26. The feature quantity extracting apparatus according  
to claim 25, wherein the feature quantity calculating section  
obtains, as the feature quantities of the audio signal, extremum  
frequencies each being a frequency corresponding to one of the  
extremums of the envelope signals derived by the envelope curve  
15 deriving section.

27. The feature quantity extracting apparatus  
according to claim 25, wherein the feature quantity calculating  
section includes:

20 an extremum frequency calculating section for  
calculating the extremum frequencies each being a frequency  
corresponding to one of the extremums of the envelope signals  
derived by the envelope curve deriving section; and

a space calculating section for calculating spaces  
25 between adjacent extremum frequencies as the feature quantities

of the audio signal.

28. The feature quantity extracting apparatus according to claim 27, wherein the space calculating section  
5 obtains, as the feature quantities of the audio signal, numerical values which represent a space as a ratio to a prescribed reference value.

29. The feature quantity extracting apparatus according  
10 to claim 28, wherein the space calculating section obtains, as the prescribed reference value, the lowest of the extremum frequencies.

30. The feature quantity extracting apparatus according  
15 to claim 28, wherein the space calculating section obtains, as the prescribed reference value, a value of difference between the lowest and the second lowest of the extremum frequencies.

31. A program recording apparatus comprising the feature  
20 quantity extracting apparatus of claim 1, which receives television program data containing an audio signal and a video signal, and is capable of recording the television program data to a recording medium, wherein the feature quantity extracting apparatus obtains a feature quantity of the audio signal contained in the television  
25 program data,

wherein the program recording apparatus further comprises:

a recording control section for controlling recording of the television program data to the recording medium;

5 a feature quantity storage section which stores at least a set of a feature quantity of an audio signal and control instruction information associated therewith, the audio signal containing music played in a television program to be recorded, the control instruction information instructing the recording  
10 control section to perform or stop recording of the television program;

a feature quantity comparison section for determining whether the audio signal contained in the television program data matches with the audio signal containing the music  
15 played in the television program based on both the feature quantity obtained by the feature quantity extracting apparatus and the feature quantity stored in the feature quantity storage section, and

wherein when the feature quantity comparison section  
20 determines that the audio signal contained in the television program data matches with the audio signal containing the music played in the television program, the recording control section performs the control of performing or stopping recording of the television program data to the recording medium in accordance with  
25 an instruction indicated by control instruction information which

is stored in the feature quantity storage section and associated with a feature quantity of the audio signal having been determined as matching with the audio signal containing the music played in the television program.

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32. The program recording apparatus according to claim 31, further comprising an auxiliary recording section for recording only a prescribed amount of television program data received, wherein the feature quantity storage section stores information  
10 associated with a set of a feature quantity and control instruction information associated with the feature quantity, the information indicating elapsed time from starting of the television program to be recorded to playing of music, which is contained in an audio signal having the feature quantity, in the television program,  
15 and

wherein in the case where the feature quantity comparison section determines that there is a match, and control instruction information, which is stored in the feature quantity storage section and associated with the feature quantity of the audio signal  
20 having been determined as being a match, instructs recording of the television program, the recording control section starts recording of the television program data received to the recording medium while recording the television program data recorded in the auxiliary recording section to the recording medium, a duration  
25 of the television program data to be recorded to the recording

medium corresponding to the elapsed time indicated by the information associated with the control instruction information.

33. A program reproduction control apparatus comprising  
5 the feature quantity extracting apparatus of claim 1, which receives television program data containing an audio signal and a video signal, and is capable of reproducing the television program data, wherein the feature quantity extracting apparatus obtains a feature quantity of the audio signal contained in the television  
10 program data,

wherein the program recording apparatus further comprises:

a reproduction control section for controlling reproducing of the television program data;

15 a feature quantity storage section which stores at least a set of a feature quantity of an audio signal and control instruction information associated therewith, the audio signal containing music played in a television program to be reproduced, the control instruction information instructing the reproduction  
20 control section to perform or stop reproducing of the television program;

a feature quantity comparison section for determining whether the audio signal contained in the television program data matches with the audio signal containing the music  
25 played in the television program based on both the feature quantity

obtained by the feature quantity extracting apparatus and the feature quantity stored in the feature quantity storage section, and

wherein when the feature quantity comparison section  
5 determines that the audio signal contained in the television program data matches with the audio signal containing the music played in the television program, the recording control section performs the control of performing or stopping reproducing of the television program data in accordance with an instruction indicated  
10 by control instruction information which is stored in the feature quantity storage section and associated with a feature quantity of the audio signal having been determined as matching with the audio signal containing the music played in the television program.

15 34. The program reproduction control apparatus according to claim 33, wherein the television program data is recorded in a recording medium, and

wherein the program reproduction control apparatus further comprises an editing section capable of editing the  
20 television program data recorded in the recording medium.